

## CLAIMS

1. A device to be inserted between a grounded external voltage source and a load to provide low insertion loss for differential mode currents and high insertion loss for grounded currents, the device comprising:

at least one voltage line and a ground to receive at least one voltage from the grounded external voltage source;

at least one filter coupled to the at least one voltage line to reduce a ground current from the load, the filter comprising at least one capacitor and at least one inductor;

a grounded referenced controlled voltage source operable to generate a cancellation voltage equal to a total common mode voltage, and coupled to apply the cancellation voltage across the at least one voltage line and the ground in series with the capacitor of the filter to substantially reduce a common mode voltage thereby substantially reducing ground currents associated with the common mode voltage.

2. The device of claim 1 wherein the grounded referenced controlled voltage source comprises a transformer comprising a primary winding and a secondary winding, the secondary winding electrically coupled to the ground.

3. The device of claim 2, further comprising:  
an independent power supply electrically coupled to supply power to the primary winding of the transformer independently of the grounded external voltage source.

4. The device of claim 3 wherein the at least one voltage line and a ground comprises at least two voltage lines, and further comprising:

a summing differential amplifier coupled to the voltage lines and the ground to sum a number of voltages across each of the voltage lines and the ground to determine the total common mode voltage.

5. A device to be inserted between a grounded external voltage source and a load to provide low insertion loss for differential mode currents and high insertion loss for grounded currents, the device comprising:

at least one voltage line and a ground to receive at least one voltage from the grounded external voltage source;

at least one filter coupled to the at least one voltage line to reduce a ground current from the load, the filter comprising at least one capacitor and at least one inductor;

a grounded referenced controlled voltage source operable to generate a cancellation current proportional to a total common mode voltage, and coupled to inject the cancellation current to substantially reduce a common mode voltage thereby substantially reducing ground currents associated with the common mode voltage.

6. The device of claim 5 wherein the grounded referenced controlled voltage source comprises a transformer comprising a primary winding and a secondary winding, the secondary winding electrically coupled to the ground.

7. The device of claim 6, further comprising:

an independent power supply electrically coupled to supply power to the primary winding of the transformer independently of the grounded external voltage source.

8. The device of claim 7 wherein the at least one voltage line and a ground comprises at least two voltage lines, and further comprising:

a summing differential amplifier coupled to the voltage lines and the ground to sum a number of voltages across each of the voltage lines and the ground.

9. A method of providing low insertion loss for differential mode currents and high insertion loss for ground currents for a device between a grounded external voltage source and a load, the method comprising:

receiving at least one voltage from the external source across at least one voltage line and a ground;

filtering a ground current from the load with a filter;

generating a cancellation voltage equal to a total common mode voltage,

and

applying the cancellation voltage across the at least one voltage line and a ground in series with a capacitor of the filter to substantially reduce a common mode voltage thereby substantially reducing ground currents associated with the common mode voltage.

10. The method of claim 9 wherein the at least one voltage line and a ground comprises at least two voltage lines, and further comprising:

summing a number of voltages across each of the voltage lines and the ground to determine the total common mode voltage.

11. A method of providing low insertion loss for differential mode currents and high insertion loss for ground currents for a device between a grounded external voltage source and a load, the method comprising:

receiving at least one voltage from the external source across at least one voltage line and a ground;

filtering a ground current from the load with a filter;

generating a cancellation current proportional to a total common mode voltage, and

injecting the cancellation current to substantially reduce a common mode voltage thereby substantially reducing ground currents associated with the common mode voltage.

12. The method of claim 11 wherein the at least one voltage line and a ground comprises at least two voltage lines, and further comprising:

summing a number of voltages across each of the voltage lines and the ground to determine the total common mode voltage.